



Course Title: Engineering Mathematics (3) b Year: 2nd Computer Engineering and Automatic Control.
Course Code: PME2211 Date: / 6 / 2012 (second term) Allowed time: 3 hrs No. of Pages: (2)

Remarks: (Answer the following questions. Assume any missing data...)

Problem number (1) (25 Marks)

(a) Given $A = 0.2/1 + 0.5/2 + 0.6/3 + 1/4 + 0.7/5 + 0.3/6 + 0.1/7$

(i) Calculate the weak α -cuts for $\alpha = 0.4, 0.6, 0.8$

(ii) Find \bar{A} , $CON(A)$, $A \cap \bar{A}$ and $A \cup \bar{A}$.

(b) Prove that: If A and B are two fuzzy subsets of the universal set X. Then, the following properties hold for all $\alpha, \beta \in [0,1]$: -

(i) $\alpha \leq \beta$ implies to $A_\alpha \supseteq A_\beta$

(ii) $(A \cap B)_\alpha = A_\alpha \cap B_\alpha$.

(c) Given a fuzzy relations P from A to B defined by :

$$M_P = \begin{bmatrix} 0.4 & 0.8 & 0.5 \\ 0.8 & 0.7 & 0.2 \\ 0.1 & 0.9 & 0.3 \end{bmatrix}, \text{ and } Q \text{ from B to C defined by } M_Q = \begin{bmatrix} 0.1 & 0.8 & 0.2 \\ 0.7 & 0.3 & 0.9 \\ 0.8 & 0.6 & 0.2 \end{bmatrix}$$

Find $M_{P \circ Q}$.

(d) Give two deviations between operations on ordinary sets and fuzzy sets. Illustrate your answer by examples.

Problem number (2) (30 Marks)

(a) If $u(x, y) = x^3 + 6x^2y - 3xy^2 - 2y^3$. Find an analytic function

$$f(z) = u(x, y) + i v(x, y)$$

(b) Solve the equation $\cosh z = 0.2$.

(c) Prove that " If $f(z)$ is analytic function in a simply connected domain D and if $f'(z)$ is continuous at each point within and a closed contour C in D, then

$$\oint_C f(z) dz = 0$$

(d) Find the general solution of the differential equation:

$$x^2 y'' - x y' + (x^2 + 1) y = 0$$

(a) Find Taylor and Laurent expansions represent the function $f(z)$ and determine the regions of convergence for each with center at $z_0 = 0$ and $f(z) = \frac{z}{5-z}$

(b) Evaluate the following integrals using complex integration, Gamma and Beta functions:

$$(i) \oint_{|z|=1} \frac{\cos 2z}{z^4} dz$$

$$(ii) \oint_{|z|=3} \frac{e^{2z} \sinh z}{z^2 + 4} dz$$

$$(iii) \oint_{|z-2|=5/2} \frac{z}{\sin z (1 + \cos z)} dz$$

$$(iv) \oint_{|z-2|=1} \frac{\ln z \sinh z^2}{z^4 (z^2 + \pi^2)} dz$$

$$(v) \oint_{|z|=3} \frac{e^{iz} + \sin z}{(z - \pi)^9 (z - \pi/2)} dz$$

$$(vi) \int_0^{\infty} \frac{\cos 5x}{x^4 + 16} dx$$

$$(vii) \int_0^{\pi/2} (\tan^{3.5} \theta + \tan^{5.5} \theta) e^{-\tan^2 \theta} d\theta$$

$$(viii) \int_0^2 x^5 \sqrt{8 - x^3} dx$$

$$(ix) \int_0^{\infty} \frac{x^{3/2}}{(1 + x^2)^7} dx$$

Good luck

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